

Application Analysis of Artificial Intelligence on Human Resource Management Functions

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Abstract. AI is gradually entering many industries, and HRM is no exception. There are, however, few papers that specifically discuss how AI functions in HRM and its effects. This study aims to clarify which technologies were implemented in each HRM module and how AI affects HRM depending on the six modules of HRM theory. Following a comparison of conventional HRM and smart HRM supported by AI, this essay incorporates the most recent news with an actual case study of IBM to ascertain which technologies are used. From the aspects of six modules, which include analysis and design of work, recruiting and selection, training and development, performance management, compensation and benefits, and labor relations, this research reaches thorough conclusions regarding the distinctions between conventional and intelligent HRM, what technologies can make contributions to HRM, and the dual effects AI brings like improving the work efficiency, accentuating the bias and so on.

Keywords: Human resource management, artificial intelligence, modules of HRM, technologies adopted in HRM, influences AI brings.

1. Introduction

Human resources are inextricably linked to an organization's work efficiency and success. The resource management method is evolving in tandem with the contemporary social environment. Artificial Intelligence (AI) and powerful new technologies are currently in the spotlight, and there is no doubt that AI significantly impacts humans, whether in life or at work. Everyone wants to take advantage of it and incorporate it into their work, and human resource management is no exception. What technology HRM requires, how they work, and what benefits and negatives they provide are essential considerations that merit public attention. These questions are waiting for someone to investigate and give an answer.

Taylor contributed to human resource management in 1895, bringing harmony, peace, and scientific procedures to the workplace [1] (Taylor, 1895). Noe et al. (2016) [2] proposed a human resource management model that includes six modules: analysis and design of work, recruiting and selection, training and development, performance management, compensation and benefits, and employee relations or labor relations. Wang (2014) [3] not only demonstrated the connection between six modules that correspond to the modules identified by Noe et al. (2016) [2] but also expounded on each module's fundamental roles and duties. HRM is made up of these six fundamental modules. Whatever the era or technology, the investigation of HRM is always centered on these six characteristics.

2. Introduction of HRM Six Modules

Noe et al. (2016) [2] and Wang (2014) [3] defined what each module needs to do. In terms of job analysis and design, what was required was projecting future human resource changes per the enterprise's strategic goals. It is critical to address two issues: what kind of employees are required and how many of each type of employee are required. The primary responsibilities are work analysis and job analysis. Regarding recruitment and selection, the primary tasks include recruiting, publishing job descriptions, interviewing, testing, and coordinating the employment of temporary personnel. The

goals of training and development are to assist employees in improving their theoretical quality, professional capacity, and behavioral quality. Orientation, skill training, growth programs, and career development are all important. Performance management and performance and management are planning for salary, providing motivation, offering timely feedback to employees, and assuring the production and reproduction of labor, respectively, aiding performance management with incentive effects. According to Noe et al. (2016) [2], performance management tasks include performance measurement, preparation and administration of performance appraisals, feedback and coaching, and discipline. Compensation and benefits responsibilities contain wage and salary administration, incentive pay, insurance, vacation, retirement plans, profit sharing, health and wellness, and stock plans. The third module is labor relations, and its main function is to retain talents, fulfill due functions while managing labor relations, and deal with problems following labor law. Making attitude surveys, employee handbooks, supplying labor law compliance, relocation, and outplacement services are more specific.

This study compiled and formed Table 1 for the functional analysis of HRM six modules and their responsibilities. HR can achieve success and work well because each module works effectively together.

Table 1. HRM Modules AND ASSOCIATED RESPONSIBILITIES

Human Resource Module	Responsibilities
Analysis and Design of Work	Predict future human resource changes based on the enterprise's own strategic goals. Solve two critical problems: what types of employees are required and how many of each type of employee are required. Job analysis and job description.
Recruiting and Selection	Choose the proper people and prevent bias. Recruiting, publishing job descriptions, interviewing, testing, and organizing the usage of temporary personnel are all part of the job.
Training and Development	Assist employees in improving their theoretical knowledge, professional skills, and behavioral quality. Orientation, skill development, development programs, and career advancement.
Performance Management	Prepare for compensation, motivate staff, and deliver timely feedback. Performance evaluations, feedback and coaching, and discipline are all aspects of performance management.
Compensation and Benefits	Ensure labor production and reproduction, and aid performance management through incentive effects. Administration of wages and salaries, incentive pay, insurance, vacation, retirement programs, profit sharing, health and wellness, and stock plans.
Labor Relations	Retain talent, fulfill necessary functions when managing labor relations, and understand labor legislation. Employee attitude surveys, employee handbooks, labor law compliance, relocation, and outplacement services are all available.

Source: Adapted from Noe et al. (2016) and Wang (2014).

2.1. Compare traditional HRM and Smart HRM

Smart HRM is generally more convenient, time-consuming, cost-effective, accurate, and efficient than traditional HRM [4] (Kamber, 2023). AI algorithms can help human resource management by ensuring better decisions for managers, employees, and HR processes. As a result, the accuracy of HRM decisions can be improved. AI significantly improves the quality of HR choices [5] (Lindebaum et al., 2020). According to Chen et al. (2020) [6], traditional human resource planning always results in the one-sided, incorrect, and late study of internal and external environmental variables, resulting in poor analysis of human resource supply and demand. However, Chen et al. (2020) [6] argued that relying on AI technologies like big data and machine learning will help enterprises get access to internal and external environmental data more quickly, which then allows for a more precise and

practical analysis of the demand and supply for human resources and, ultimately, for more effective human resource planning. It considerably improves the decision-making accuracy in HR. Using conventional interview and testing procedures does not always result in the right individuals being matched with suitable vacancies. On the other hand, because AI can scan and analyze resumes, HR can be directed to utilize AI to find the perfect candidate and connect them with the appropriate job vacancies. According to a study, AI rejects 75% of inappropriate resumes. In addition to saving time, this behavior increases the effectiveness of the work and its accuracy [7] (Kambur and Yildirim, 2022). According to studies, traditional education has been used for many years, but only 20–30% of what is learned is put into practice by people, which results in low efficiency. However, as new communication tools and artificial intelligence develop, flexibility is felt by adhering to the training provided in some areas [7] (Kambur, 2022). According to Chen et al. (2020) [6], who work in performance management and benefits and compensation, achieving complete objective fairness in a performance appraisal can be challenging due to some subjective factors of leaders or supervisors. Unfairness is one of the leading causes of employee dissatisfaction. Since AI can produce a scientifically sound pay standard by merging data such as GDP growth, labor costs, and even industry salary data, it can modernize and improve the compensation and benefits system to be more objective and acceptable. Traditionally, it has been challenging to predict the rate of employee turnover. However, according to Strohmeier (2015) [8], using Artificial Neural Networks (ANNs), a knowledge and information discovery class that can handle clustering, classification, and prediction tasks, has made it possible. In conclusion, new technology has many benefits for all HR functions. Table 2 provides a comparison of conventional HRM and AI-assisted HRM.

Table 2. Comparison of Traditional HRM and Smart HRM

HRM Six Modules	HRM	
	Traditional HRM	Smart HRM
Analysis and Design of Work	⑩ one-sided, inappropriate ⑩ untimely analysis of internal and external environmental conditions ⑩ ineffective analysis	⑩ obtain internal and external environmental data quickly ⑩ provide more accurate and efficient analysis of human resources demand and supply ⑩ complete more precise human resource planning
Recruitment and Selection	⑩ difficult to ensure the proper candidates to match the right position	⑩ seek for the right candidate and match them with the correct job positions ⑩ saves time but improves the job efficiency and work accuracy
Training and Development	⑩ low efficiency: only 20-30% of learning concepts being put into practice by individuals	⑩ flexibility is beginning to be experienced by adhering to the training offered in some areas
Performance Management	⑩ lead to employee dissatisfaction: difficult to achieve complete objective fairness due to some subjective factors of leaders or supervisors	⑩ more objective and reasonable since AI enables output a scientific and fair compensation standard
Benefits and Compensation	⑩ lead to employee dissatisfaction: difficult to achieve complete objective fairness due to some subjective factors of leaders or supervisors	⑩ more objective and reasonable since AI enables output a scientific and fair compensation standard
Labor Relation	⑩ turnover rate is difficult to forecast	⑩ resolve clustering, classification, and prediction tasks, helped to predict the turnover of employees

In general, AI advances human resource management. It facilitates HRM and increases productivity and decision-making precision. Additionally, it saves businesses and managers money and time. However, AI also has adverse effects in real life in addition to good ones. Only some essays thoroughly discuss and convincingly demonstrate the benefits and drawbacks of artificial intelligence in six different contexts. In order to assess the individual technologies that have been deployed and what benefits and drawbacks exist, this essay will use the case of IBM.

3. Techniques, Real Cases, Positive and Negative Influences AI Brings

The leading provider of business solutions and information technology in the world is International Business Machine Corporation (IBM), and they have developed their own AI and data system dubbed Watsonx. On the other hand, it has been discovered, by their official website, that they have utilized AI and cutting-edge technology in various HRM modules. In the case of IBM, describing the technology used in each HRM module is preferable.

3.1. Analysis and Design of Work

Human resource managers can use Intelligence Decision Supporting System (IDSS) to analyze and develop activities. According to Long (2016) [9], IDSS effectively used descriptive statistical methods to define employee responsibility, avoiding the waste of human and material resources. Dong (2023) [10] stated that Big Data assists in talent management, scientifically planning talent structure, staff position deployment, or organizational structure adjustment, and providing strong support for the healthy development of organizations. Management efficiency is improved through artificial intelligence. In practice, IBM employs Big Data and IDSS to analyze vast amounts of data and provide recommendations during the job analysis decision-making process. In a world of fast information change, management can make it better. Some of the suggestions put forward by employees may also be reported promptly.

3.2. Recruitment and Selection

Some of the suggestions put forward by employees may also be reported promptly. Long (2016) [9] claimed that OLAP online analytical processing might edit and update the system database at any time, and the system can decide on the applicants in advance based on the required criteria and create suitable jobs and pay. Big Data and Natural Language Processing help screen resumes and communicate with job candidates [11] (Zhang et al., 2023). According to Kolam (2022) [12], AI can weed out inappropriate candidates by employing sophisticated data methods. It can also match candidates and job opportunities more accurately by thoroughly studying their personalities and competencies. However, there are certain disadvantages to using AI for recruitment and selection. Carmen (2020) [13] proposed that during the AI interview, the phenomenon of technology anticipating the gender, race, or sexual orientation of participants is quite likely to occur, which may result in some sexual bias or discrimination. Furthermore, Liu (2023) [14] believes that some managers and interviewers are still waiting to accept AI interviews fully. According to Guenole and Feinzig (2021) [15], IBM Applied AI-powered workflows such as IDSS can raise hiring manager net promoter score (NPS) by 50 percentage points during the hiring process, and automated hiring speeds up the process by categorizing 97% of applications by complexity and type. AI accelerates the hiring process, produces a high-quality pipeline of candidates, offers management confidence in hiring results, and assists recruiters in writing more precise job descriptions (JD) with less bias. Digital processes speed up recruiting and provide a better experience for job seekers for both recruiters and employees.

3.3. Training and Development

According to Zhang et al. (2023) [11], Big Data, artificial neural networks, data mining, perplexing logic, genetic algorithms, virtual reality, or augmented reality have all been used in training and

development. Based on Big Data, job development plans for employees can be developed that align with their circumstances, thereby improving comprehensive ability and professional literacy—the more specific plan and information aid in lowering training expenses and improving training outcomes. AI trains corporate staff scientifically and effectively. Emerging technologies can enable visualization training and optimize training results [16] (Wang, 2020). IBM provides tailored training to employees using its IBM Watson Education platform [7] (Kambur, 2022). IBM's Watson artificial intelligence system, which includes natural language processing, clustering, and semi-supervised learning, evaluates people's skills and recommends what other employees with similar backgrounds should learn next. According to managers, the AI's automated assessments are nearly 90% correct. IBM's AI-powered learning platform raises course enrollments and completions, accelerating crucial skill acquisition.

3.4. Performance Management

IDSS, Big Data, machine learning, and fuzzy logic are examples of prevalent technology. They are unavoidable in performance management. The intelligence decision-supporting system can use mature scientific methodologies such as 360-degree performance evaluation. Big Data can assist managers in understanding their employees' situations in all aspects, allowing them to make detailed evaluations of their staff and improve their work involvement. The evaluation is objective and accurate, while performance is followed in real-time and employee potential can be projected. According to Buck (2018) [18], AI-driven tools can provide a more unbiased approach to performance evaluation, talent management, and employee recognition by utilizing raw data and insights generated by algorithms, and they can do so enterprise-wide, providing a genuinely apples-to-apples view and comparison when it comes to identifying outstanding employees and future leaders. Luo (2022) [19], on the other hand, argued that AI still has limitations in performance management. The first is a lack of justice, as the algorithm's opacity may result in the black-box technique.

Furthermore, data security is jeopardized due to the possibility of data leakage. Furthermore, Zhang et al. (2023) [11] believed that the human resources department would use advanced technology to intentionally collect employees' personality preferences, family history, and relationship networks. During this deployment phase, avoiding excessive requests for employee information and invasions of employee privacy is difficult. IBM employs chatter analysis within a company's firewall to study social media and provide targeted recommendations for specific leaders to help enhance employee engagement on their teams.

3.5. Compensation and Benefits

Regarding compensation and benefits, IDSS assists managers in developing a fair wage appraisal system that can serve as the foundation for a specialized salary management data flow. The vice president of IBM, Lamoreaux says if remuneration decisions are based on only one or two data points, such as tenure and performance, a manager can only decide with analytical support. However, managers must evaluate various elements, including market prices and the proclivity to learn. AI is required with more data points to avoid underpaying some and overpaying others.

3.6. Labor relations

Machine learning, expert systems, and artificial neural networks can all be used to forecast turnover rates and assist in taking preventative measures to lower them. According to Wang (2020) [16], AI can significantly lower the cost of brain drain. Artificial intelligence technology can be used rationally to compile and evaluate internal and external personnel data and to understand the reasons behind brain drain and a particular staff turnover rate. Zhang et al. (2023) [11] share the belief that AI technology can forecast staff turnover rates and then develop pertinent policies to stop the loss of talent. By putting multiple AI applications into use, IBM was able to save 107 million dollars, but they also noted that AI technology has the potential to compromise employee privacy. Guenole and

Feinzig (2021) [15] mentioned that IBM used the chatbot in employee relations, which is inexpensive and easy to train. The chatbot uses natural language and is equipped with well-developed frequently asked question lists about the HR process; it provides employees with a good working experience because it offers real-time answers at any time, day or night. Table 3 sums up the adopted technology and its positive and negative influences.

Table 3. Adopted Technology in HRM and POSIVE and Negative Influences

Human resource management module	Adopted technologies in the field of artificial intelligence	Applied technology	Case application scenario	The positive effect of artificial intelligence technology application	Negative problems caused by the application of artificial intelligence technology
Analysis and Design of Work	Intelligence Decision Supporting System (IDSS), Big Data.	IDSS: avoid waste and duplication of human resources and material resources. Big data: talent management and scientific planning of talent structure and can allocate staff positions or adjust organizational structure to provide strong support for the healthy development of enterprises.	IBM uses Big Data and IDSS to analyze large amounts of data and make recommendations in the process of job analysis decisions.	Management can make the right decisions more quickly in an era of rapid information change. Some of the ideas put forward by employees also have the opportunity to be reported in a timely manner.	
Recruiting and Selection	Intelligence Decision Supporting System (IDSS), Online Analytic Processing (OLAP technology), Big Data, natural language processing.	OLAP online analysis process: realize the system database modification and update at any time, determine the candidates, allocation of appropriate positions and salaries. Big data: reduce the difficulty of employee screening and	IBM Applied AI-powered workflows (IDSS) can increase hiring manager NPS by 50 percentage points during the hiring process, and automated hiring accelerates the process by sorting 97% of applications by complexity and type. For HR departments (managers), AI speeds up the	For HR departments, AI speeds up the hiring process, creates a high-quality pipeline of candidates, gives managers confidence in hiring results, and helps recruiters write more detailed job descriptions	sexual bias or discrimination some managers and interviewers contemporarily cannot completely accept AI interview.

		improves recruitment efficiency under the premise of matching guarantor posts. Natural language processing: screen resumes and communicate with candidates.	hiring process, creates a high-quality pipeline of candidates, gives managers confidence in hiring results, and helps recruiters write more detailed job descriptions (JDS) with less bias. For recruiters (employees), digital processes speed up recruitment and ensure a better experience for job seekers.	(JDS) with less bias. For recruiters (employees), digital processes speed up recruitment and ensure a better experience for job seekers.	
Training and Development	Big Data, artificial neural networks, data mining, confusing logic, genetic algorithms, virtual reality/augmented reality.	Big data: develop work development plans that are more in line with their own conditions and improve their comprehensive abilities and professional qualities. More targeted, thereby reducing training costs and enhancing training results.	IBM uses its own artificial intelligence system, Watson (including natural language processing, clustering, and semi-supervised learning), to determine what skills employees currently have and make recommendations based on what other employees with the same background should learn next.	IBM's AI-driven learning platform is increasing enrollments and course completions, thereby accelerating strategic skill acquisition. AI's automated assessments are nearly 90% accurate, making it easier to assess recent skills.	
Performance Management	Intelligence Decision Supporting System (IDSS), Big Data, machine learning, fuzzy logic.	IDSS system: use the existing mature scientific evaluation methods: 360-degree performance evaluation method. Big data: help	IBM uses chatter analysis to analyze social media within a company's firewall and develop personalized recommendations for specific leaders to help increase		Lack of fairness due to the black-box mechanism, Invasion of privacy information.

		managers grasp the situation of employees in all aspects, and on this basis, conduct comprehensive evaluation of employees to improve their work participation. Assessments are objective and accurate, track performance in real time, and predict employee potential.	employee engagement on their teams.		
Compensation and Benefits	Intelligence Decision Supporting System (IDSS)	IDSS: form a fair salary evaluation system based on the above modules to form a specific salary management data flow.		It reduces prejudice.	
Labor Relations	Artificial neural networks, expert systems, machine learning, natural language.	Natural language: apply in some robots or chatbots.	IBM uses chatbot in employee interaction, and it can provide the real-time answer at any time.	Turnover rates can be predicted, which helps to take measures to reduce turnover in advance.	

IBM has integrated AI with nearly other HRM modules except for benefits and compensation. Despite lacking IBM examples in this module, other reading materials claim that utilizing AI in the compensation and benefits module has an advantage. Additionally, IBM only enjoys a few advantages in terms of performance and management, so the specific benefits in this module are still to be explored.

4. Research Results

Traditional HRM is less ineffective and may contain bias and incomplete analyses of internal and external conditions in the module of analysis and work design, which makes it considerably distinct from smart HRM. Traditional HRM often needs help to ensure that the right individuals match the best job positions during recruitment and selection, and there may be instances of ineffective training. It can be challenging for managers to remain completely objective in the modules on performance

management and benefits and compensation. When managers resolve the labor relations issue, it is difficult to predict the turnover rate. With the help of AI, however, the precision of placing the right people in the correct positions improves. Additionally, AI handles the crucial issue of manager bias and subjectivity. Training experience also becomes more adaptable. AI is even capable of forecasting employee churn in the workplace. Advanced technologies like IDSS, Big Data, Machine Learning, and others have permeated HRM practice. It has been discovered that AI uses a fair degree of convenience when applied, using IBM Corporation as a real-world example.

Analysis and Design of Work: Big Data and IDSS both play significant roles in the work's analysis and design phases. It can help managers make wise decisions by preventing waste and duplication of human resources.

Recruiting and Selection: Natural language processing, OLAP, Big Data, and IDSS all play a part in the hiring and selection process. Writing more thorough job descriptions and speeding up the hiring process are both possible, but there are drawbacks. Discrimination may result, and not everyone will be amenable to an AI interview.

Training and Development: Big Data, data mining, virtual reality, confusing logic, artificial neural networks, and genetic algorithms all play a role in training and development. They boost enrolment and quicken skill development, among other advantages.

Performance Management: The functions of IDSS, Big Data, fuzzy logic, and machine learning in the performance management area are that they can grasp the situation of employees from all angles and give managers an objective assessment, but it is important to note that the data of private information may be invaded, and that some unfairness may occur.

Benefits and Compensation: The IDSS technology is effective and lessens prejudice in the area of benefits and compensation.

Labor Relations: Natural language machine learning, artificial neural networks, and expert systems are utilized in labor relations. These technologies can anticipate and reduce the turnover rate in advance.

5. Conclusion

Under the circumstance that AI is sophisticated enough to participate daily work of human beings, there need to be more articles comprehensively elaborating on the adopted technologies and summarizing the two-sided impacts AI takes from six HRM modules. Therefore, this study concerns these aspects from six specific modules and makes some conclusions. The six modules of HRM each have their distinct roles and responsibilities. Hence distinctive technologies are employed. Big Data, artificial neural networks, data mining, confusing logic, genetic algorithms, virtual reality, and augmented reality are all used by HRM in training and development. IDSS and Big Data are used for work analysis. OLAP, Big Data, and natural language processing are used for recruitment and selection. Intelligent Decision Supporting System (IDSS), Big Data, machine learning, and fuzzy logic are used by HRM in performance management; IDSS is also used in compensation and benefits; and in labor relations, artificial neural networks, expert systems, Machine Learning, and Natural Language Processing make a significant difference. Before the advent of AI, traditional management faced issues such as frequent judgment errors, manager bias, and time and money wastage; however, with AI's help, smart HRM is typically more convenient, time-consuming, cost-effective, and accurate. This essay discovers that IBM has used artificial intelligence in five modules, except for compensation and benefits. In the work analysis and design, as well as recruiting and selection, they have used Big Data and IDSS. The advantages include the ability for managers to recruit the best candidates and make better, more accurate decisions with the aid of AI. However, prejudice may manifest during hiring, and certain interviewees may resist AI interviews. As well as using its own AI system Watson for training and development, IBM has also used chatter analysis for performance management. Its high evaluation accuracy—nearly 90%—helps companies evaluate personnel and analyze training effectiveness. However, the performance management module's use of AI assistance

could lead to unfairness and data breaches. Research suggests that technology might lessen prejudice in performance management, where even IBM has practical applications. IBM can offer a chatbot to assist employees with a real-time response in labor relations. Additionally, the study demonstrates that AI can anticipate turnover and lower it before it occurs. Regarding benefits and compensation, IBM may await further development or wait for an opportunity to use AI. Individuals are also looking forward to researching additional businesses that have combined HRM with AI in the future. It may have some drawbacks, but AI has indeed made significant contributions to HRM and has evolved into a mainstream tool in the HR departments of many large organizations. We hope AI will increase its advantages, correct its flaws, and better improve HRM in the future.

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